Of these proposals, U.S. Patent No. 5,268,790 proposes a zoom lens composed of four lens units having positive, negative, positive, and negative optical powers. In the zoom lens, which executes zooming by moving second and third lens units, diffractive optical elements are used in the second lens unit used for zooming and in the third lens unit for correcting variations of an image surface caused by the zooming.

Please substitute the following paragraph for the paragraph starting at page 11, line 23 and ending at page 12, line 7. A marked-up copy of this paragraph, showing the changes made thereto is attached.

In this embodiment, a phase shape ϕ of a diffractive optical surface (diffraction surface) is defined by the following formula.

$$\phi(h,m) = (2\pi/m\lambda_0)\,(C_1 h^2 + C_2 h^4 + C_3 h^6 \ldots) \ldots \text{(a)}$$

where h denotes a vertical height with respect to the optical axis, m denotes the diffraction order of diffraction light, λ_0 denotes a design wavelength (that is, the wavelength at which the diffraction surface exhibits the highest diffraction efficiency), and Ci denotes a phase coefficient ($i = 1, 2, 3 \ldots$).

Please substitute the following paragraph for the paragraph starting at page 12, line 13 and ending at line 15. A marked-up copy of this paragraph, showing the changes made thereto is attached.

In the embodiment, the diffraction order m of diffraction light is 1, and the design wavelength λ_0 is the wavelength of a d-line (587.6 nm).

Please substitute the following paragraph for the paragraph starting at page 16, line 13 and ending at line 24. A marked-up copy of this paragraph, showing the changes made thereto is attached.

Ordinarily, the diffraction efficiency of a diffraction grating at a design order, that is, the order at which light of a particular wavelength is concentrated by the diffraction grating, (for example, the first order) tends to decrease as the wavelengths of light striking the diffraction grating stray from an optimized wavelength of light (that is, a design wavelength at which the diffraction surface exhibits the highest diffraction efficiency), whereas diffraction efficiency of diffraction light of zeroth and secondary orders, which are other than the design order but are particularly near thereto, tend to increase.

Please substitute the following paragraph for the paragraph starting at page 18, line 19 and ending at page 19, line 2. A marked-up copy of this paragraph, showing the changes made thereto is attached.

As is apparent from Fig. 14, the diffraction efficiency at the design order is reduced away from the optimized wavelength of 530 nm, whereas the diffraction efficiency of the diffraction light is increased in the zeroth and second orders which are in the vicinity of the design order. When the diffraction efficiency of the diffraction light increases in orders other than the design order, the diffraction light is made to flare, which reduces the resolution of the optical system.

Please substitute the following paragraph for the paragraph starting at page 19, line 19 and ending at line 23. A marked-up copy of this paragraph, showing the changes made thereto is attached.

As can be seen from Fig. 16, the diffraction efficiency of the design order has a high diffraction efficiency of at least 95% over the entire wavelength region being used by constructing the diffraction grating as a laminated structure.

Please substitute the following paragraph for the paragraph starting at page 22, line 11 and ending at line 15. A marked-up copy of this paragraph, showing the changes made thereto is attached.

The coefficients of the above formula (a) are written in a phase equation showing the surface of a diffractive optical element. At that time, the design diffraction order is a first order and a design wavelength is a d-line.

IN THE CLAIMS

Please amend Claims 1, 3, 12, and 35 through 40 to read as follows. A marked-up copy of Claims 1, 3, 12, and 35 through 40, showing the changes made thereto, is attached. Note that all the claims currently pending in this application, including those not presently being amended, have been reproduced below for the Examiner's convenience.

1. (Twice Amended) A zoom lens, comprising in sequence from an object side to an image side:

a first lens unit having a positive optical power;